Airworthiness Certification

Dassault/Dornier

Alpha Jet

AIR-230 Airworthiness Certification Branch
Federal Aviation Administration
Washington, DC
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Cover Photograph: Força Aérea Portuguesa (Portuguese Air Force). http://www.emfa.pt

Introduction – Alpha Jet Airworthiness Certification

This document provides information to assist in the airworthiness certification and safe civil operation of an Alpha Jet.

Attachment 1 provides a general overview of this document. Attachment 2 contains background information on the Alpha Jet. Attachment 3 lists historic airworthiness issues with the Alpha Jet for consideration in the certification, operation, and maintenance of these aircraft. The list is not exhaustive, but includes our current understanding of risks that should be assessed during in the certification, operation, and maintenance of these aircraft. Concerns regarding particular issues may be mitigated in various ways. Some may be mitigated via the aircraft maintenance manual(s) or the aircraft inspection program. Others may be mitigated via operating procedures i.e., SOPs) and limitations, aircraft flight manual changes, or logbook entries

Not all issues in attachment 3 may apply to a particular aircraft given variations in aircraft configuration, condition, operating environment, or other factors. Similarly, circumstances with an aircraft may raise other issues not addressed by attachment 2 that require mitigation. Attachment 4 includes additional resources and references.

Attachment 1 – Overview of this Document

Purpose

This document is to provide all those involved in the certification, operation, and maintenance of the Alpha Jet with safety information and guidance to help assess and mitigate safety hazards for the aircraft. The existing certification procedures in FAA Order 8130.2, Airworthiness Certification of Aircraft and Related Products, do not account for many of the known safety concerns and risk factors associated with many high-performance former military aircraft. These safety concerns and risk factors associated with many high performance former military aircraft include—

- Lack of consideration of inherent and known design failures;
- Several single-point failures;
- Lack of consideration for operational experience, including accident data and trends;
- Operations outside the scope of the civil airworthiness certificate;
- Insufficient flight test requirements;
- Unsafe and untested modifications;
- Operations over populated areas (the safety of the non-participating public has not been properly addressed in many cases);
- Operations from unsuitable airports (i.e., short runways, Part 139 (commercial) airports);
- High-risk passenger carrying activities taking place;
- Ejection seat safety and operations not adequately addressed;
- Weak maintenance practices to address low reliability of aircraft systems and engines;
- Insufficient inspection schedules and procedures;
- Limited pilot qualifications, proficiency, and currency;
- Weapon-capable aircraft not being properly demilitarized, resulting in unsafe conditions;
- Accidents and serious incidents not being reported; and
- Inadequate accident investigation data.

Research of Alpha Jet Safety Data

The aircraft, relevant processes, and safety data are thoroughly researched and assessed. This includes—

- Aviation Safety (AVS) Safety Management System (SMS) policy and guidance;
- Historical military accident/incident data and operational history;
- Civil accident data;
- Safety risk factors;
- Interested parties and stakeholders (participating public, non-participating public, associations, service providers, air show performers, flying museums, government service providers, airport owners and operators, many FAA lines of business, and other U.S. Government entities);
- Manufacturing and maintenance implications; and
- Design features of the aircraft.

This Document

The document is a compilation of known safety issues and risk factors identified from the above research that are relevant to civil operations. This document is organized into four major sections:

- General airworthiness issues (grey section),
- Maintenance (yellow section),
- Operations (green section), and
- Standard operating procedures and best practices (blue section).

This document also provides background information on the aircraft and an extensive listing of resources and references.

How to Use the Document

This document was originally drafted as job aids intended to assist FAA field office personnel and operators in the airworthiness certification of these aircraft. As such, some of the phrasing implies guidance to FAA certification personnel. The job aids were intended to be used during the airworthiness certification process to help identify any issues that may hinder the safe certification, maintenance, or operation of the aircraft. The person performing the certification and the applicant would to discuss the items in the job aid, inspect documents/records/aircraft, and mitigate any issues. This information would be used to draft appropriate operating limitations, update the aircraft inspection program, and assist in the formulation of adequate operating procedures. There are also references to requesting information from, or providing information to the person applying for an airworthiness certificate. We are releasing this document as drafted, with no further updates and revisions, for the sole purpose of communicating safety information to those involved in the certification, operation, and maintenance of these aircraft. The identified safety issues and recommended mitigation strategies are clear and can be considered as part of the certification, operation, and maintenance of the air aircraft.

Attachment 2—Background Information on the Alpha Jet Aircraft

The Alpha Jet is a small tandem seat, twin-engine jet trainer and light attack aircraft designed by the Franco-German collaboration between Dassault and Dornier. Two prototypes were to be built by Dassault in France and two were to be built by Dornier in Germany. The first French prototype performed its first flight in October 1973.

The French Air Force decided to use the Alpha Jet primarily as a trainer. The French variant was known as the Alpha Jet E and initial introduction took place in May 1979. A total of 176 production Alpha Jet E machines were delivered up to 1985. The Luftwaffe decided to use the Alpha Jet mainly in the light strike role. The first production German Alpha Jet performed its maiden flight on April 12, 1978, with deliveries beginning in March 1979. It was designated the Alpha Jet A. The Luftwaffe obtained 175 machines up to 1983. Other versions and variants were exported to many of the foreign air forces that purchased the aircraft.

Manufacture of Alpha Jet sub-assemblies was divided between France and Germany, with plants in each country performing final assembly and checkout. A total of 512 Alpha Jet aircraft were produced.

Source: Força Aérea Portuguesa (Portuguese Air Force) . http://www.emfa.pt

Current and former operators include France, Portugal, Belgium, Morocco, Nigeria, Togo, Egypt, and Thailand. In the 1990s, the Luftwaffe slowly withdrew its Alpha Jets from service, the last example being officially retired in December 1998. Many of the surviving Alpha Jet A models were sold and exported. As a result, the bulk of the Alpha Jet aircraft now in civilian use are former Luftwaffe aircraft. For example, Alpha Jets USA of Arlington, Virginia, has begun to import Alpha Jets into the United States and sell them in the civilian market. Today, at least ten Alpha Jets are operated by private companies in the United States while two others, from Portuguese origin, have recently been imported. In Canada, 16 aircraft (former Luftwaffe Alpha Jet Aircraft) are based in Montreal, Quebec and operated by a Canadian military support services company.

Specifications (Alpha Jet)

General Characteristics

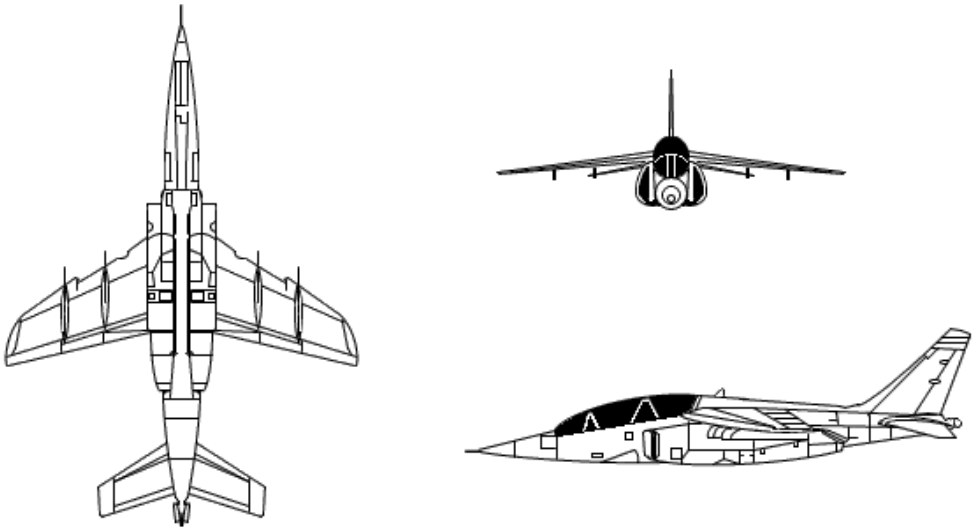
- Crew: two
- Length: 43 ft 5 in
- Wingspan: 29 ft 10¾ in
- Height: 13 ft 9 in
- Wing area: 188.4 ft²
- Empty weight: 7,750 lb
- Loaded weight: 11,000 lb
- Maximum takeoff weight: 16,535 lb
- Powerplant: 2 × SNECMA Turbomeca Larzac 04-C5 turbofans, 2,976 lb

Performance

- Maximum speed: 621 mph at sea level
- Stall speed: 104 mph (flaps and undercarriage down)
  - Combat radius: 329 nm, lo-lo-lo profile, gun pod, under-wing weapons and two drop tanks
- Ferry range: 1,586 nm
- Service ceiling: 48,000 ft
- Rate of climb: 11,220 ft/min

Armament / Weapons and Related Systems

Cannon pods, rockets, missiles (AIM-9 Sidewinders; Matra Magic IIs, AGM-65 Maverick), and bombs.



Source: U.S. Army.

Issue #	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
Alpha Jet Preliminary and General Airworthiness Inspection Issues			
1.	Aircraft Familiarization	Become familiar with the aircraft before initiating the certification process. One of the first steps in any aircraft certification is to be familiar with the aircraft in question, in this case the Alpha Jet. Such knowledge, including technical details are essential in establishing a baseline as the certification process moves forward.	
2.	Preliminary Assessment	Conduct a preliminary assessment of the aircraft may be conducted to ascertain condition and general airworthiness.	
3.	Denial	If the aircraft does not meet the certification requirements and the special airworthiness certificate is denied, the FAA will provide a letter to the applicant stating the reason(s) for denial and, if feasible, identify which steps may be accomplished to meet the certification requirements. Should this occur, a copy of the denial letter will be attached to FAA Form 8130-6 and forwarded to AFS-750, and made a part of the aircraft's record.	
4.	Potential Reversion Back to Phase I	Notify the applicant that certain modifications to the aircraft will invalidate Phase II. These include: (a) structural modifications, (b) aerodynamic modifications, including externally mounted equipment except as permitted in the limitations issued, and (c) change of engine make, model, or power rating (thrust or horse power). The owner/operator may return the aircraft to Phase I in order to flight test specific items as required. However, major modifications such as those listed above may require new operating limitations.	
5.	Identify Alpha Jet Version and Sub-Variants	Identify the specific Alpha Jet version being certificated. There are major differences among Alpha Jet aircraft, not just in terms of engines but major systems and weapons capability.	
6.	Major Structural Components	Ask the applicant to identify and document the origin, condition, and traceability of major structural components.	
7.	T.O. 00-5-1 AF Technical Order System	Become familiar with T.O. 00-5-1 AF technical Order System, May 1, 2011. This document provides guidance in the USAF TO system, which guides much of the documentation associated with the T-33 aircraft. Note: NATO uses a similar system.	
8.	Airframe and Engine Data	Applicants should provide the following: Airframe: import country, N-Number, manufacture year and serial number, airframe time, and airframe cycles. Engine: manufacture date and serial number, overhaul data and location, serial number, and engine time, cycles, and date(s).	
9.	Aircraft Records	Request and review the applicable military and civil aircraft records, including aircraft and engine logbooks. For example, in cases involving Ex-Portuguese Air Force Alpha Jets, ask the applicant to produce that air force's records for the aircraft.	
10.	Federal Aviation Administration (FAA) Records Review	Review the existing FAA airworthiness and registration files (EDRS) and search the Program Tracking and Reporting Subsystem (PTRS) for safety issue(s) and incidents.	
11.	Foreign CAA Airworthiness and Registration Records	Because some Alpha Jets may come into the United States from other countries namely Canada, ask the applicant to provide copies of the relevant airworthiness and registration files for the aircraft. Operating limitations are particularly important.	

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12.	FAA Form 8100-1	Use FAA Form 8100-1 to document the airworthiness inspection. Using this form facilitates the listing of relevant items to be considered, their nomenclature, any reference (that is, North Atlantic Treaty Organization (NATO) manual; FAA Order 8130.2, Airworthiness Certification of Aircraft and Related Products; regulations) revision, satisfactory or unsatisfactory notes, and comments. Items to be listed include but are not limited to— 1. FAA Form 8130-6; 2. § 21.193 of Title 14 of the Code of Federal Regulations (14 CFR); 3. FAA Form 8050-1; 4. 14 CFR § 45, 45.11(a); 5. FAA Order 8130.2, paragraphs 4002a(7) and (10), 4002b(5), 4002b(6), 4002b(8), 4111c, and 4112a(2); 6. 14 CFR § 91.205; 7. § 91.417(a)(2)(i), Airframe Records and Total Time, Overhaul; and 8. § 91.411/91.413, Altimeter, X-ponder, Altitude Reporting, Static System Test	
13.	Functionality Check	Ask the applicant to prepare the aircraft for flight, including all pre-flight tasks, startup, run-up, and taxi.	
14.	Adequate Alpha Jet Manuals and Related Documentation	To safely operate an Alpha Jet, the owner/operator must have a complete set of the applicable manuals [NATO manuals] such as flight manuals, inspections and maintenance manuals, and engine manuals. Note: The reference to NATO manuals in this document refers to manuals in use by NATO Alpha Jet operators, including the Luftwaffe, the French Air Force, the Belgian Air Force, and the Portuguese Air Force. Applicable Alpha Jet manuals include— • GAF TO 1F-AJET-1, Technical Flight Manual; • GAF TO 1F-AJET-2-1, Technical Manual Maintenance, General Aircraft Description; • GAF TO 1F-AJET-2-2, Technical Manual Maintenance, General Aircraft Maintenance; • GAF TO 1F-AJET-2-3, Technical Manual Maintenance, Airframe; • GAF TO 1F-AJET-2-4, Technical Manual Maintenance, Engine; • GAF TO 1F-AJET-2-5, Technical Manual Maintenance, Fuel System; • GAF TO 1F-AJET-2-6, Technical Manual Maintenance, Landing Gear; • GAF TO 1F-AJET-2-7, Technical Manual Maintenance, Hydraulic System; • GAF TO 1F-AJET-2-8, Technical Manual Maintenance, Pressurization and Air Conditioning; • GAF TO 1F-AJET-2-9, Technical Manual Maintenance, Oxygen System; • GAF TO 1F-AJET-2-10, Technical Manual Maintenance, Flight Controls; • GAF TO 1F-AJET-2-11, Technical Manual Maintenance, Electrical Systems; • GAF TO 1F-AJET-2-12, Technical Manual Maintenance, Instruments; • GAF TO 1F-AJET-2-13, Technical Manual Maintenance, Radio, Navigation, and ECM Systems; • GAF TO 1F-AJET-2-14, Technical Manual Maintenance, Armament and Weapons Electronics; • GAF TO 1F-AJET-2-15, Technical Manual Maintenance, Wiring Diagrams; • GAF TO 1F-AJET-2-15, Volume 2 Wiring Diagrams; • GAF TO 1F-AJET-3-1, Ejection Seat and Technical Manual Emergency Parachute System; • GAF TO 1F-AJET-6, Technical Inspection; and • GAF TO 1F-AJET-6-1, Technical Manual Time Schedule for Time Change Items. Note: The use of and reference to NATO countries manuals are made in this document because they represent an equivalent to the acceptable USAF references.	

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15.	Availability of Documents	Review the aircraft inspection program (AIP) to verify compliance with the applicable version of the Alpha Jet aircraft list of applicable NATO publication manuals or equivalent document. This document should contain the applicable Alpha Jet Technical Orders.	
16.	Applicant/Operator Capabilities	Review the applicant's/operator's capabilities, general condition of working/storage areas, availability of spare parts, and equipment.	
17.	Scope and Qualifications for Restoration, Repairs, or Maintenance.	Familiarize yourself with the scope of the restoration, repairs, and maintenance conducted by or for the applicant.	
18.	Operational Risk Management (ORM)	Recommend an ORM-like approach be implemented by the Alpha Jet owner/operator. ORM employs a five-step process: (1) Identify hazards, (2) Assess hazards, (3) Make risk decisions, (4) Implement controls, and (5) Supervise.	
19.	Limiting Duration of Certificate	Refer to § 21.181 and FAA Order 8130.2, regarding the duration of certificates, which may be limited. An example would be to permit operations for a period of time to allow the implementation of a corrective action or changes in limitations. In addition, an ASI may limit the duration if there is evidence additional operational requirements may be needed at a later date.	
20.	Compliance With § 91.319(a)(1)	Inform the operator operations of the aircraft are limited under this regulation. The aircraft cannot be operated for any purpose other than the purpose for which the certificate was issued. For example, in the case of an experimental exhibition certificate, the certificate can be used for air show demonstrations, proficiency flights, and flights to and from locations where the maintenance can be performed. Such a certificate is NOT IN EFFECT for flights related to providing military services (that is, air-to-air gunnery, target towing, electronic countermeasure (ECM) simulation, cruise missile simulation, and air refueling) Also refer to *Military/Public Aircraft Operations* below.	
21.	Multiple Certificates and Public Aircraft Operations, That Is, DOD Contracts. Also Refer to *Military/Public Aircraft Operations* Below.	In those cases involving multiple airworthiness certificates, ensure the applicant submits information describing how the aircraft configuration is changed from one to the other. This is important because, for example, some research and development (R&D) activities may involve equipment that must be removed to revert back to the Exhibition configuration. Moreover, the procedures should provide for any additional requirement(s), such as additional inspections, to address situations such as high-G maneuvering that could have an impact on the aircraft and/or its operating limitations. Similarly, removing equipment that could be considered part of a weapon system may be required (refer to *Demilitarization* below). All applications for an R&D certificate must adhere to FAA Order 8130.29, Issuance of a Special Airworthiness Certificate for Show Compliance and/or Research and Development Flight Testing. A similar process should be identified to revert back from public aircraft operations.	
22.	Demilitarization	Verify the aircraft has been adequately demilitarized. The Alpha Jet has a secondary mission as light attack. As such, it would be equipped with weapon systems. Removal of the gun pods alone, for example, does not suffice. Wiring, switches, and other subsystems need to be disabled as well. Depending on the version or variant, weapon systems installed in the Alpha Jet include an integrated weapon system (laser range finder, inertial navigation unit, Head-Up Display), Mauser BK-27 27mm gun pack, DEFA 30mm centerline pod, SNEB 68 mm rockets, AN/ALE-40 system, AN/ALR-56 radar warning receiver (RWR), Paveway II Enhanced Laser Guided Training Round (ELGTR), BDU-57 Laser-Guided Training Round, AGAVE or Anemone radar, and Matra F1 pod. Safety issues with these systems include inadvertent discharge of flares, toxic chaff, electrical overloads of the aircraft electric system, danger of inadvertent release, structural damage, complex flight limitations, and harmful emissions. Technical Order TO 00-80G-1 Make Safe Procedures for Public Static Display, dated November 30, 2002, can be used as a reference as well.	

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23.	Federally Obligated Airport Access	Inform the operator that Alpha Jet operations may be restricted by airports because of safety considerations. As provided by Title 49 of the United States Code (U.S.C.) § 47107(a), a federally obligated airport may prohibit or limit any given type, kind, or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the civil aviation needs of the public. Additionally, per FAA Order 5190.6, FAA Airport Compliance Manual, the airport should adopt and enforce adequate rules, regulations, or ordinances as necessary to ensure safety and efficiency of flight operations and to protect the public using the airport. In fact, the prime requirement for local regulations is to control the use of the airport in a manner that will eliminate hazards to aircraft and to people on the ground. In all cases concerning airport access or denial of access, and based on FAA Flight Standards Service safety determination, FAA Airports is the final arbiter regarding aviation safety and will make the determination (Director's Determination, Final Agency Decision) regarding the reasonableness of the actions that restrict, limit, or deny access to the airport (refer to FAA Docket 16-02/08, FAA v. City of Santa Monica, Final Agency Decision; FAA Order 2009-1, July 8, 2009; and FAA Docket 16-06-09, Platinum Aviation and Platinum Jet Center BMI v. Bloomington-Normal Airport Authority).	
24.	Environmental Impact (Noise)	Inform the operator that Alpha Jet operations may be restricted by airport noise access restrictions and noise abatement procedures in accordance with 49 U.S.C. § 47107. As a reference, refer to FAA Order 5190.6.	

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Alpha Jet Maintenance Manual(s), Aircraft Inspection Program (AIP), and Servicing			
25.	Changes to Aircraft Inspection Program (AIP)	Consider whether the FAA-accepted AIP is subject to revisions to address safety concerns, alterations, or modifications to the aircraft. Section 91.415, Changes to Aircraft Inspection Programs, requires "whenever the Administrator finds that revisions to an approved aircraft inspection program under § 91.409(f)(4) or § 91.1109 are necessary for the continued adequacy of the program, the owner or operator must, after notification by the Administrator, make any changes in the program found to be necessary by the Administrator."	
26.	Maintenance Practices	In addition to any guidance provided by the manufacturer/military service(s), consider Advisory Circular (AC) 43.13-2B, Acceptable Methods, Techniques, and Practices - Aircraft Alterations, and AC 43.13-1B, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair, to verify safe maintenance practices.	
27.	Qualifications for Inspections	Ensure only FAA-certificated repair stations and FAA-certificated mechanics with appropriate ratings as authorized by 14 CFR § 43.3 perform inspections on the Alpha Jet.	
28.	Modifications	Per § 21.93, verify major changes do not create an unsafe condition and determine whether new operating limitations will be required. The information contained in appendix A can be used as an aid.	
29.	Adequate Maintenance Schedule and Program	Ensure the AIP follows NATO requirements as appropriate concerning inspections. Under NATO standards, for example, the proper reference would be 1T-AJet-6-1 (inspection schedule and replacement times) or a similar document. This is important when developing an inspection program under § 91.409. The inspection program must comply with both hourly and calendar inspection schedules. The only modifications to the military AIP should be related to the removal of military equipment and weapons. Deletions should be properly documented and justified. A 100-hour, 12-month inspection program under appendix D to part 43 is generally not adequate for sophisticated aircraft like the Alpha Jet.	
30.	Prioritize Maintenance Actions	Recommend the adoption of a risk management system that reprioritizes high-risk maintenance actions in terms of (a) immediate action, (b) urgent action, and (c) routine action. Also refer to *Recordkeeping, Tracking Discrepancies, and Corrective Action* below.	
31.	Recordkeeping, Tracking Discrepancies, and Corrective Action	Check applicant recordkeeping. The scope and content of §§ 43.9, 43.11, and 91.417 are acceptable. The USAF Form 781 process, the U.S. Navy's Maintenance Action Form (MAF), or a NATO equivalent process will assist with recordkeeping and help verify acceptable level of continued operational safety (COS) for this type of aircraft. Three types of maintenance writeups can be found inside the USAF Form 781: (1) an informational, that is, a general remark about a problem that does not require mitigation; (2) a red slash for a potentially serious problem; and (3) a red "X" highlighting a safety of flight issue that could result in an unsuccessful flight and/or loss of aircraft—no one should fly the aircraft until the issue is fixed. For more information on recordkeeping, refer to AC 43-9, Maintenance Records.	
32.	Qualifications of Maintenance Personnel	Check for appropriate qualifications, licensing, and type-specific training of personnel engaged in managing, supervising, and performing aircraft maintenance functions and tasks. The National Transportation Safety Board (NTSB) has found the use of non-certificated mechanics with this type of aircraft has been a contributing factor to accidents. Recommend only FAA-certificated repair stations and FAA-certificated mechanics with appropriate ratings as authorized by § 43.3 perform maintenance on this aircraft.	
33.	Ground Support, Servicing and Maintenance Personnel Recurrent Training	Recommend regular refresher training be provided to ground support, servicing and maintenance personnel concerning the main safety issues surrounding servicing and flight line maintenance of the Alpha Jet. Such a process should include a recurrent and regular review of the warnings, cautions, and notes listed in documents such as TO 1T-AJet-2-1, Technical Manual General Airplane.	
34.	Parts Storage and Management and Traceability	Recommend establishing a parts storage program that includes traceability of parts.	

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35.	Maintenance Records and Use of Tech Data	As required by FAA Order 8130.2, conduct a detailed inspection of maintenance records. Verify maintenance records reflect inspections, overhauls, repairs, time-in-service on articles, and engines. Ensure all records are current and appropriate technical data is referenced. This should not be a cursory review. Maintenance records are commonly poor and incomplete for imported aircraft. Refer to *Adequate Alpha Jet Manuals and Related Documentation* above.	
36.	"On Condition" Inspections	If "on condition" inspections are considered, adhere to the NATO program and/or provide adequate data to justify that practice for the applicable part or component. "On condition" must reference an applicable standard (that is, inspect the fuel pump to an acceptable reference standard, not just "it has been working so far.") Each "on condition" inspection must state acceptable parameters. "On condition" inspections are not appropriate for all parts and components.	
37.	Airframe, Engine, and Component Replacement Intervals	Verify compliance with required replacement intervals as outlined in appropriate and most current NATO inspection guidance. If components are not replaced per the military guidance, ask for data to justify extensions. Applicants should establish and record time in service for all life-limited components and verify compliance with approved life limits. Set time limits for overrun of intervals and track cycles. Evaluate any overruns of inspection or maintenance intervals. If inspections or maintenance are overrun, a Special Flight Permit may be requested to fly the aircraft to a location where maintenance can take place.	
38.	Alpha Jet Airframe Life Limit	Ask applicant to document any life extension modifications, and which elements or components have been modified/inspected. The Alpha Jet has an airframe life limit of 4,500 hours. An "on condition" inspection does not mitigate this limitation.	
39.	Inspect and Repair as Necessary (IRAN)	If IRAN is proposed, verify it is detailed and uses adequate technical data (that is, include references to acceptable technical data) and adequate sequence for its completion. An IRAN must have a basis and acceptable standards. It is not analogous to an "on condition" inspection. It must have an established level of reliability and life extension. An IRAN is not a "homemade" inspection program.	
40.	Combining Inspection Intervals Into One	Set time limits for overrun (flex) of inspection intervals.	
41.	Aircraft Storage and Returning the Aircraft to Service After Inactivity	Verify the applicant has a program to address aircraft inactivity and specifies specific maintenance actions for return to service per the applicable Alpha Jet inspection schedule (for example, after 31 days). The aircraft should be housed in a hangar during maintenance. When the aircraft is parked in the open, it must be protected from the elements, that is, full blanking kit and periodic anti-deterioration checks are to be carried out as weather dictates.	
42.	Specialized Tooling for Alpha Jet Maintenance	Verify adequate tooling, jigs, and instrumentation are used for the required periodic inspections and maintenance per the Alpha Jet maintenance manuals.	
43.	Technical Orders Issued While in Service	Verify the AIP references and addresses the applicable NATO TOs that were issued to the Alpha Jet during military service to address airworthiness and safety issues, maintenance, modifications, updates to service instructions and operations of the aircraft.	
44.	Time Critical Technical Orders (TCTOs) or NATO Equivalent	Verify the AIP specifically accounts for, addresses and documents the applicable TCTOs issued to the Alpha Jet, while in service. Compliance with the TCTOs is essential for safe operations. If the AIP only makes reference to a few TCTOs issued in 1999, for example, it would not be adequate.	
45.	NATO Alpha Jet Safety Supplements	Verify the applicant/operator has copies of the applicable safety supplements for the Alpha Jet and that they are incorporated into the AIP or operational guidance as appropriate. The most current version of the Airplane Flight Manual (AFM) (or "-1", the TO number for AFM) usually provides a listing of affected safety supplements and this can be used as a reference.	
46.	Corrosion Due to Age and Inadequate Storage	Evaluate adequacy of corrosion control procedures. Age, condition, and types of materials used in the Alpha Jet may require some form of corrosion inspection control. Ask whether a corrosion control program is in place. If not, ask for steps taken or how it is addressed in the AIP. Recommend the use of TO 1-1-691, Corrosion Prevention and Control Manual.	

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47.	Larzac 04-C5 Engine Maintenance Procedures	Verify the AIP adheres to the NATO/engine manufacturer maintenance procedures requirements. Note: The Larzac 04 powers the Alpha Jet trainer and light fighter. The Larzac 04 is a two-shaft turbofan engine, was developed between 1969 and 1973. From 1975 to 1988; 1,274 units were produced by MTU Aero Engines (MTU) together with its partners Snecma, Turbomeca, Klöckner-Humboldt-Deutz (today Rolls-Royce Deutschland).	
48.	Larzac 04-C5 Engine MTU Aero Engines on Condition Inspection	“”Verify a manufacturer’s (MTU) approved “on condition” program that is being used for Larzac 04 engine “On Condition” maintenance, not a homemade substitute.	
49.	Manufacturer’s and/or NATO Engine Modifications	Verify the AIP addresses the incorporation of the manufacturer’s and NATO modifications to the Larzac 04-C5 engine installed. The NTSB and some foreign civil aviation authorities (CAA) have determined a causal factor in some accidents is the failure of some civil operators of former military aircraft to incorporate the manufacturer's recommended modifications to prevent engine failures.	
50.	Cycles and Adjustment the Larzac 04-C5 Engine Replacement Intervals	Ask if both engine cycles and hours are tracked. If not, recommend it be done.	
51.	Larzac 04-C5 Engine Inspections and Time Between Overhaul (TBO)	Verify the applicant has established the proper inspection intervals and TBO/replacement interval for the specific engine type and adhere to those limitations and replacement intervals for related components. Justification and FAA concurrence is required for an inspection and TBO above those set in the appropriate Alpha Jet/engine inspection guidance. Clear data on TBO/time remaining on the engine at time of certification is critical as is documenting those throughout the aircraft life cycle.	
52.	Engine Thrust	Verify the AIP includes measuring actual thrust of the engine and tracking engine operating temperatures.	
53.	Use of Different Fuels	Verify the AIP addresses how the use of different fuels may require changes or additions to the Larzac 04-C5 engine inspection and maintenance programs.	
54.	Engine Ground Run	After engine reassembly, check to verify the engine goes through a ground run and check for leaks. Confirm it achieves the required revolutions per minute for a given exhaust gas temperature (EGT), outside air temperature, and field elevation.	
55.	Fire Detection System	Verify the serviceability of the fire detection system.	
56.	Servicing, Engine Fire Servicing Personnel Unfamiliar With the Alpha Jet Create Hazardous Situations	Verify the operator warns servicing personnel via training and markings of the fire hazard of overfilling oil, hydraulic, and fuel tanks. Lack of experience with Alpha Jet servicing is a safety concern. Require supervision of servicing operations and fire safety procedures.	
57.	Fire Guard	Verify maintenance, servicing, preflight, and postflight activities include fire guard precautions.	
58.	Engine Start	Verify the AIP includes procedures for documenting all unsuccessful starts.	
59.	Engine Storage	Review engine storage methods and ascertain engine condition after storage. Evaluate calendar time since overhaul. For example, the use of an engine with 50 hours since a 1991 overhaul may not be adequate and a new overhaul maybe required after a specified time in storage. Note: The FAA’s position on experimental exhibition of former military aircraft is that engines that have exceeded storage life limits are susceptible to internal corrosion, deterioration of seals and coatings, and breakdown of engine preservation lubricants.	
60.	Engine Foreign Object Damage (FOD)	Verify adoption of an FOD prevention program (internal engine section, external, and air intake). Use air intake covers designed for the Alpha Jet.	

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61.	Engine Condition Monitoring	As part of the engine maintenance schedule, recommend an engine Spectrographic Oil Analysis Program (SOAP) be implemented in accordance with the manufacturer's or NATO's guidance. If baseline data exists, this can be very useful for failure prevention. If manufacturer baseline data does not exist, this may still warn of impending failure.	
62.	Broken Systems (Fuel, Oil, and Hydraulic) Lines	Verify the AIP includes procedures for inspecting and replacing fuel, oil, and hydraulic lines according to the applicable NATO requirements; for example, Mil-DTL-8794 and Mil-DTL-8795 specifications.	
63.	Systems Functionality and Leak Checks	Verify procedures are in place to check all major Alpha Jet systems in the aircraft for serviceability and functionality. Verify the leak checks of all systems are properly accounted for in the AIP per the NATO requirements.	
64.	Oil, Fuel, and Hydraulic Fluids	Verify procedures are in place to identify and use a list of equivalents of materials for replacing oil, fuel, and hydraulic fluids. A good practice by many operators is to include a cross-reference chart for NATO and U.S. lubricants as part of the AIP.	
65.	Electrical System and Batteries	Verify functionality of the generator and the compatibility of the aircraft's electrical system with any new battery installation or other system and component installation or modification. Avoiding overload conditions is essential because this is a known problem with the aircraft's electrical system.	
66.	Inertial Navigation System	If installed, verify that the INS system (i.e., SAGEM Uliss 81 INS) is adequately covered in the AIP. Note: Its weapon functions need to be disabled.	
67.	Doppler Navigation Radar	If installed, verify that the Doppler navigation radar is adequately covered in the AIP. Note: Its weapon functions need to be disabled.	
68.	Borescope Engine	Recommend the AIP incorporate borescope inspections of the engine at 50 hours per the applicable inspection procedures. AC 43.13-1B can be used as a reference.	
69.	Pitot/Static, Lighting, and Avionics and Instruments	Verify compliance with all applicable 14 CFR requirements (that is, § 91.411) concerning the pitot/static system, exterior lighting (that is, adequate position and anti-collision lighting), transponder, avionics, and related instruments.	
70.	Oxygen System	Emphasize the inspection of the oxygen system and any modifications. Compliance with § 91.211 Supplemental Oxygen is required. Recommend adherence to 14 CFR § 23.1441 Oxygen Equipment and Supply. Moreover, per FAA Order 8900.1, change 124, chapter 57, Maintenance Requirements for High-Pressure Cylinders Installed in U.S. Registered Aircraft Certificated in Any Category, each high-pressure cylinder installed in a U.S. registered aircraft must be a cylinder manufactured and approved under the requirements of 49 CFR, or under a special permit issued by the Pipeline and Hazardous Materials Safety Administration (PHMSA) under 49 CFR part 107. There is no provision for the FAA to authorize "on condition" for testing, maintenance or inspection of high-pressure cylinders under 49 CFR (PHMSA).	
71.	Other High-Pressure Cylinders	Emphasize the proper inspection of any other high-pressure cylinders installed in the aircraft, that is, fire bottles and nitrogen gas (N2). As per FAA Order 8900.1, change 124, chapter 57, Maintenance Requirements for High-Pressure Cylinders Installed in U.S. Registered Aircraft Certificated in Any Category, each high-pressure cylinder installed in a U.S. registered aircraft must be a cylinder manufactured and approved under the requirements of 49 CFR, or under a special permit issued by the PHMSA under 49 CFR part 107. There is no provision for the FAA to authorize "on condition" for testing, maintenance, or inspection of high-pressure cylinders because the oversight under 49 CFR (PHMSA). For example, the fire bottles are time-sensitive items, and may have a limit of 5 years for hydrostatic testing for example. The issue is when the bottles are removed from the aircraft. It is industry knowledge that non-U.S. bottles may be installed as long as they are within their hydrostatic test dates. A problem arises when removing the bottles for hydrostatic testing. Maintenance programs require these bottles to be hydrostatic tested. Once the non-U.S. bottles are removed from the aircraft, they are not supposed to be hydrostatic tested, recharged, or reinstalled in any aircraft. Moreover, those bottles cannot be serviced (on board) after the testing date has expired.	
72.	Anti-G Suit System	If installed, verify its serviceability.	

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73.	Cockpit Instrumentation Markings	Verify all cockpit lettering and symbology is legible and uses proper English terminology.	
74.	Pressurization Vessel	Verify the AIP incorporates the inspection of the pressurized sections of the aircraft (cockpit), noting pressure-cycles, and any repairs in the area.	
75.	Safety Markings and Stenciling	Verify appropriate safety markings required by Alpha Jet technical manuals (that is, stenciling and "Remove Before Flight" banners) have been applied and are in English. These markings provide appropriate warnings/instruction regarding areas of the aircraft that could be dangerous. These areas include intakes, exhaust, air brakes, and ejection seats. In the case of ejections seat systems, and as noted in FAA Order 8130.2, paragraph 4074(e), "a special airworthiness certificate will not be issued before meeting this requirement."	
76.	Incorrect Hardware	Verify the AIP incorporates the use of the correct hardware; for example, bolts. This must be emphasized in all civil operations because (1) original hardware may be difficult to acquire and (2) some aircraft may incorporate the non-approved items today.	
77.	Cockpit FOD	To preclude inadvertent ejection, flight control interference, pressurization valves clogging and other problems, verify the AIP addresses thorough inspection and cleaning of the cockpit area. This is a standard NATO/USAF/U.S. Navy practice.	
78.	Tires and Wheels	Verify use of proper tires and/or equivalent substitutes (including inner tubes) and adherence to any tire limitation such as allowed number of landings, inflation requirements, and the use of retreaded tires. Wheels must be properly and regularly inspected and balanced.	
79.	Explosives and Propellants	In addition to verifying manufacturer and service (NATO) requirements are followed, check compliance with applicable Federal, State, and local requirements for explosives and propellants in terms of use, storage and disposal.	
80.	In-Flight Canopy Separation	The AIP should address the proper maintenance of transparencies and canopy locks. Monitoring and inspection of the canopy for crazing should be conducted every 10 hours of flight.	
81.	Canopy Seals	Test canopy seals for leaks (that is, use ground test connection).	
82.	Emergency Canopy Jettison Mechanism	Verify the AIP includes testing the Alpha Jet emergency canopy jettison mechanism. It must be functional and properly inspected per the applicable technical guidance.	
83.	Brake System	Emphasize a detailed inspection of the brake assemblies, adhere to manufacturer's inspection guidelines and replacement times and consider more conservative inspections. Recommend brake inspection at 20 to 30 landings.	
84.	External Fuel Tanks	Verify the type, condition, installation, and removal of drop tanks meet requirements of the manufacturer or military operator. Only external tanks cleared for use by the aircraft manufacturer and NATO may be used on the aircraft. The only modification allowed to the external tanks is to prevent jettisoning. Accidental jettisoning of the tanks is a safety hazard. Any means of releasing the tanks during aircraft operation must be disabled.	
85.	Hoses and Cables	Inspect and replace hoses and cables appropriately.	
86.	Grounding	Verify adequate procedures are in place for grounding the aircraft.	
87.	Antennae	Verify any original antennas are compatible with all installed electronics.	
88.	Transparencies Problems	Ensure proper transparencies maintenance for safe operations. Monitor/inspect canopy for crazing every 10 hours of flight.	

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89.	Hard Landings and Over G Situations	Verify hard landing and over-G inspection programs are adopted. This is especially important when acrobatics are performed or when the aircraft is involved in military support missions outside the scope of its experimental certificate (that is, public aircraft operations).	
90.	Parts Fabrication	Verify engineering (that is, Designated Engineering Representative (DER)) data supports any part fabrication by maintenance personnel. Unfortunately, many of modifications are typically made without adequate technical and validation data. AC 43-18, Fabrication of Aircraft Parts by Maintenance Personnel, may be used for guidance.	
91.	Wing and Tail Bolts and Bushings	Ask about inspections and magnafluxing of these items. Recommend the AIP incorporate other commonly used and industry-accepted practices involving non-destructive inspection (NDI) if not addressed in the manufacturer's maintenance and inspection procedures.	
92.	Flight Control Balancing and Deflection	Verify flight controls were balanced per the maintenance manual(s) after materials replacement, repairs, and painting. Verify proper rigging and deflection. In several former military aircraft, damage to flight controls has been noticed when inadequate repairs have been performed. If there are no adequate records of the balancing of the flight controls, the airworthiness certificate should not be issued.	
93.	Aileron Deformation and Failure	Because air loads can result in aileron deformation and structural failure, carefully inspect the aileron before and after each flight and adequately address itin the AIP.	
94.	Air Brakes	Verify proper condition, deflection, and warning signage.	
95.	Accurate Weight & Balance (W&B)	Review original W&B paperwork. Verify adherence to NATO guidance, as well as FAA-H-8083-1 if documentation by the applicant appears to be inadequate. Several former military aircraft accidents have been linked to center of gravity miscalculations.	
96.	"Experimental" Markings	Verify the word "EXPERIMENTAL" is located immediately next to the canopy railing, on both sides, as required by § 45.23(b). No subdued markings.	
97.	N-Number	Verify the marking required by §§ 45.25 and 45.29(b) concerning the registration number (N-number), its location, and its size are complied with. If non-standard markings are proposed, verify compliance with Exemption 5019, as amended, under regulatory Docket No. 25731.	
98.	Type of Ejection Seat System	Identify the type of ejection seat fitted to the aircraft. The type of seat changes many aspects of operations and maintenance. For example, Alpha Jets are typically equipped with the Martin-Baker Mk-10N ejection seats. The French Air Force Air Alpha Jets are equipped with Martin-Baker Mk.4 seats. The manufacturer continues to support both types. However, Stencel SIIIS-3 series of ejection seats have also been fitted to some Alpha Jets, notably German aircraft in the early 1980s. Note: There is photographic evidence some Alpha Jet operators have actually installed both types in the same aircraft at the same time. If this is the case, this practice must be authorized under the applicable NATO TOs.	
99.	Ejection Seat System Maintenance	Ensure maintenance and inspection of ejection seat and other survival equipment is performed in accordance with the NATO applicable TOs by trained personnel. Include specific inspections and recordkeeping for pyrotechnic devices. Ejection seat system replacement times must be adhered to. No "on condition" maintenance may be permitted for rocket moors and propellants. Make the distinction between replacement times, that is, "shelf life" vs. "installed life limit." For example, a 9-year replacement requirement is not analogous to a 2-year installed limit. If such maintenance documentations and requirements are not available, the seat must be de-activated.	
100.	Canopy Destruct System	Ensure maintenance and inspection of ejection seat system includes the maintenance of any canopy destruct system. Some Alpha Jets have this feature. Note: Some aircraft have ejection seats which fire through the canopy. For this, canopy destruct systems are used. These usually have an explosive cord (MDC - Miniature Detonation Cord or FLSC - Flexible Linear Shaped Charge) embedded within the acrylic plastic of the canopy. The MDC is initiated when the eject handle is pulled, and shatters the canopy over the seat a few milliseconds before the seat is launched. Sub-systems include: detonating chord, MDC retaining plates, plunger mechanism, detonator unit, and breech unit.	
101.	Ejection Seat System Maintainers Training	Require adequate ejection seat training for maintenance crews. On May 9, 2012, an improperly trained mechanic accidentally jettisoned the canopy of a former military aircraft while performing maintenance, seriously injuring himself.	

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102.	Ejection Seat Modifications	Do not permit ejection seat modifications unless directly made by the manufacturer.	
103.	Ground Support Equipment Maintenance	Verify the AIP provides for the proper maintenance of all required ground support equipment.	

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Alpha Jet Operating Limitations			
104.	AIP and Related Documentation	As part of the operating limitations, require adherence to the AIP and related documentation.	
105.	Understanding of the Operating Limitations	Require the applicant to sign an Acknowledgment of Special Operating Limitations form.	
106.	Alpha Jet Pilot in Command (PIC) Requirements	As a matter of policy, the FAA requires a pilot have a total of 1,000 hours before they can be issued an authorization to act as PIC of an experimental jet unless they were trained by the U.S. military as a jet pilot. Refer to the appropriate pilot authorization policy. Recommend proficiency and currency of 3 hours per month and five takeoffs and landings. Also recommend a minimum of 10 to 15 hours of dual training. Note: The USAF restricted to two the number of aircraft types a pilot could hold currency on.	
107.	Flight Manuals	Ensure the PIC operates the aircraft as specified in the most current version of the flight manual (NATO manuals -1) for the Alpha Jet version being flown. Note: An French Air Force Alpha Jet manual is not suitable for operations of an ex-Portuguese AF Alpha Jet.	
108.	Flight Servicing Certificate	Recommend a Flight Servicing Certificate or a similar document be used by the ground crew (that is, crew chief or airplane captain) to attest to the aircraft's condition (that is, critical components such as tires) before each flight to include the status of all servicing (that is, liquid levels, fuel levels, hydraulic fluid, and oxygen). Note: A crew chief (USAF) or airplane captain (U.S. Navy) is the person (a noncommissioned officer) who is in charge of the day-to-day operations, maintenance and ground handling of an aircraft.	
109.	Adequate Annual Program Letter	Verify the applicant's annual program letter contains sufficient detail and is consistent with applicable regulations and policies. (Many applicants/operators submit inadequate and vague program letters and fail to submit them on an annual basis.) Also verify the proposed activities (for example, an air show at a particular airport) are consistent with the applicable operating limitations (for example, avoiding populated areas) and do not pose a safety hazard, such as the runway being too short. Refer to http://www.warbirds-eaa.org/forms/.	
110.	Alpha Jet Flight Manual Warnings, Cautions, and Notes	Consider requiring review (before flight) of all Alpha Jet flight manual warnings, cautions, and notes.	
111.	Maintenance and Line Support	Verify the aircraft is operated with qualified crew chief/plane captains especially during preflight and post-flight inspections as well as assisting the PIC during startup and shutdown procedures.	
112.	Ejection Seat System PIC Training	Require adequate ejection seat training for PIC and crew, if applicable, for the type of seat installed. Note: The record shows the safety record of attempted ejections in civilian former military aircraft is very poor, typically indicating poor training leading to ejections outside of the envelope. The ejection envelope is a set of defined physical parameters within which an ejection may be successfully executed. It is primarily an interaction of two independent sets of parameters: the physically designed characteristics of the particular ejection system and the dynamics of the aircraft flight profile at the moment of ejection.	
113.	Ejection Seat System Ground Safety	Verify the safety of ejection seats on the ground. Verify ejection seats cannot be accidentally fired, including prohibiting untrained personnel from sitting on the seats.	
114.	Ejection Seat System Safety Pins	Require the PIC to carry the aircraft's escape systems safety pins on all flights and high-speed taxi tests.	

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115.	Parachutes	Comply with § 91.307, Parachutes and Parachuting. This regulation includes parachute requirements (1) that the parachute be of an approved type and packed by a certificated and appropriately rated parachute rigger, and (2) if of a military type, that the parachute be identified by an NAF, AAF, or AN drawing number, an AAF order number, or any other military designation or specification number. The parachute must also be rated for the particular ejection seat being used.	
116.	Engine Operating Limitations	Adhere to all engine limitations in the applicable NATO flight manuals.	
117.	External Stores	Prohibit the installation of external stores to the wing that were not approved by the manufacturer or the military operator. Examples include ECM and travel pods. No external stores may have an in-flight release mechanism. In FAA Order 8130.2, only aircraft certificated for the purpose of R&D may be eligible to operate with functional jettisonable external fuel tanks or stores.	
118.	Restrict Acrobatics	Restrict acrobatics per the appropriate flight manual.	
119.	Mach Meter and Airspeed Calibration	Require the installation and calibration of a Mach meter or verify the PIC makes the proper Mach determination before flight. Unless the airspeed indicator(s) is properly calibrated, transonic range operations may have to be restricted.	
120.	Accelerometer	Ensure the aircraft's accelerometer is functional. This instrument is critical to remain within the required G limitation of the aircraft.	
121.	High-Speed Controllability	Recommend limiting transonic operations by 10 percent below MMO. This provides a good safety margin and could be addressed in the operating limitations, the AFM, and related standard operating procedures (SOP).	
122.	Phase I Flight Testing	As part of Phase I flight testing, recommend that, at a minimum, all flight tests and flight test protocol(s) follow the intent and scope of acceptable NATO/USAF/U.S. Navy functionality test procedures. Phase 1 means: The initial flight testing period for a newly assembled aircraft, not newly manufactured or newly built. The aircraft needs detailed Phase I flight testing for a minimum of 10 hours. Returning a high-performance aircraft such as the Alpha Jet to flight status after restoration cannot be accomplished by a few hours of "flying around." Safe operations also require a demonstrated level of reliability.	
123.	Post-Maintenance Check Flights	Recommend post-maintenance flight checks be incorporated in the maintenance and operation of the aircraft and that TO 1-1-300, Maintenance Operational Checks and Flight Checks, June 15, 2012 be used as a reference.	
124.	Flight Over Populated Areas	Prohibit flights over populated areas, including takeoffs and landings, if the ejection seat is functional. If not, the aircraft may be operated over populated areas for the purpose of takeoff and landing only, and only in Phase II operations. The area on the surface described by the term "only for the purpose of takeoff and landing" is the traffic pattern. For the purpose of this limitation, the term "only for the purpose of takeoff and landing" does not allow multiple traffic patterns for operations such as training or maintenance checks.	
125.	Visual Meteorological Condition (VMC) and Instrument Flight Rules (IFR) Operations	Recommend day VMC operations only. If IFR operations are permitted, prohibit operations in known icing conditions—aircraft is not properly equipped for icing conditions. Comply with § 91.205.	
126.	Carrying of Passengers §91. 319(a)(2)	Prohibit the carrying of passengers (and property) for compensation or hire at all times. For hire flight training is permitted only in accordance with an FAA-issued letter of deviation authority (LODA). FAA LODA policy limits training to pilots eligible for Alpha Jet experimental aircraft authorization.	
127.	Reduce Vertical Separation Minimums (RVSM)	Prohibit operations above RVSM altitudes (FL290).	

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128.	High-Altitude Training	Recommend the PIC complete an FAA-approved physiological training course (for example, altitude chamber). Refer to FAA Civil Aerospace Medical Institute (CAMI) Physiology & Survival Training website for additional information.	
129.	Minimum Equipment for Flight	Ask the applicant to specify minimum equipment for flight and develop such a list consistent with the applicable military guidance (Manufacturer and/or NATO) and § 91.213.	
130.	Minimum Runway Length	Ensure the PIC verifies, using the appropriate aircraft performance charts (for example, the RSAF "-1-1" Performance Supplement), sufficient runway length is available considering field elevation and atmospheric conditions. To add a margin of safety, use the following: For Takeoff • No person may initiate an airplane take-off unless it is possible — to stop the airplane safely on the runway, as shown by the accelerate-stop distance data and to clear all obstacles by at least 50 ft vertically (as shown by the takeoff path data) or 200 ft horizontally within the airport boundaries and 300 ft horizontally beyond the boundaries, without banking before reaching a height of 50 ft (as shown by the takeoff path data) and after that without banking more than 15 degrees. • In applying this section, corrections must be made for any runway gradient. To allow for wind effect, takeoff data based on still air may be corrected by taking into account not more than 50 percent of any reported headwind component and not less than 150 percent of any reported tailwind component. For Landing • No person may initiate an airplane takeoff unless the airplane weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance in the AFM for the elevation of the destination airport and the wind conditions expected there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 ft above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport, the following is assumed: o The airplane is landed on the most favorable runway and in the most favorable direction, in still air. o The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of that airplane, and considering other conditions such as landing aids and terrain.	
131.	Runway Considerations	Consider accelerate/stop distances, balanced field length, and critical field length in determining acceptable runway use per Classic Jet Aircraft Association (CJAA) guidance. To enhance Alpha Jet operations, it is recommended takeoff procedures similar to the USAF minimum acceleration check speed (using a ground reference during the takeoff run to check for a pre-calculated speed) be adopted.	
132.	Jet Exhaust Dangers	Establish adequate jet blast safety procedures per the NATO -1 Flight Manual. The CJAA Jet Manual can be used as reference.	
133.	Servicing	Ensure the applicant verifies ground personnel are trained for Alpha Jet operations with an emphasis on the potential for fires during servicing. Prohibit non-trained personnel from servicing the aircraft. Note: Some Alpha Jets may be instrumented for liters or imperial gallons.	
134.	Ground Support Equipment	Verify all required ground equipment is available and in a serviceable condition.	
135.	Aerial Target Towing	Restrict all towing. Notwithstanding the standard language in the FAA Order 8130.2 limitations concerning towing, the Alpha Jet is not to be used for towing targets because such operations pose a danger to property and people on the ground and endanger the aircraft.	
136.	Hot and Pressure Refueling	Prohibit hot and pressure refueling. There are too many dangers with these types of operations.	

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137.	Personal Flight Equipment	Recommend the operator use the adequate personal flight equipment and attire to verify safe operations. This includes a helmet, oxygen mask, fire retardant (Nomex) flight suit, gloves (that is, Nomex or leather), adequate foot gear (that is, boots), and clothing that does not interfere with cockpit systems and flight controls. Operating with a live ejection seat requires a harness. Therefore, recommend only an approved harness compatible with the ejection seat be used.	
138.	ARFF Coordination	Coordinate with Aircraft Rescue and Fire Fighting (ARFF) personnel at any airport of landing (that is, safety briefing, ejection seat system).	
139.	ATC Coordination	Coordinate with Air Traffic Control (ATC) before any operation that may interfere with normal flow of traffic to ensure the requirement to avoid flight over populated areas is complied with. Note: ATC does not have the authority to waive any of the operating limitations or operating rules.	
140.	Military/Public Aircraft Operations	Some Alpha Jet operators may enter into contracts with the U.S. Department of Defense (DOD) to provide military missions such as air combat maneuvering (ACM), target towing, and electronic counter measures (ECM). Such operations constitute public aircraft operations (PAO), not civil operations under FAA jurisdiction. The operator is required to obtain a declaration of PAO from the contracting entity or risk civil penalty for operating the aircraft outside the limits of the FAA experimental certificate. Verify the operator understands the differences between PAOs and operations under a civil certificate. For example, the purpose of an airworthiness certificate in the exhibition category is limited to activities listed in §21.191(d). Note: The following notice, which was issued by AFS-1 in March 2012, needs to be communicated to the applicant: "Any pilot operating a U.S. civil aircraft with an experimental certificate while conducting operations such as air-to-air combat simulations, electronic counter measures, target towing for aerial gunnery, and/or dropping simulated ordinances is operating *contrary* to the limits of the experimental certificate. Any operator offering to use a U.S. civil aircraft with an experimental certificate to conduct operations such as air-to-air combat simulations, electronic counter measures, target towing for aerial gunnery, and/or dropping simulated ordinances pursuant to a contract or other agreement with a foreign government or other foreign entity would not be doing so in accordance with any authority granted by the FAA as the State of Registry or State of the Operator. These activities are not included in the list of experimental certificate approved operations and may be subject to enforcement action by FAA. For those experimental aircraft operating overseas *within* the limitations of their certificate, FAA Order 8130.2, section 7, paragraph 4071(b) states that if an experimental airworthiness certificate is issued to an aircraft located in or outside of the United States for time-limited operations in another country, the experimental airworthiness certificate must be accompanied by appropriate operating limitations that have been coordinated with the responsible CAA *before* issuance." For additional information on public aircraft status, refer to 76 FR 16349, Notice of Policy Regarding Civil Aircraft Operators Providing Contract Support to Government Entities (Public Aircraft Operations), dated March 23, 2011.	
141.	TO 00-80G-1 and Display Safety	Recommend the use of TO 00-80G-1, Make Safe Procedures for Public Static Display, dated November 30, 2002, in preparing for displaying of the aircraft. This document addresses public safety around aircraft in the air show/display environment. It covers hydraulics, egress systems, fuel, arresting hooks, electrical, emergency power, pneumatic, air or ground launched missiles, weapons release (including inert rounds), access panels, antennae, and other and other equipment that can create a hazard peculiar to certain aircraft.	

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Alpha Jet Aircraft Flight Manual (AFM), SOPs, and Best Practices			
142.	AFM Addendums	Consider additions or restrictions to the AFM. Operational restrictions should be also addressed in the AFM.	
143.	In-Flight Canopy Separation	Revise the pilot checklist and back-seat occupant briefing to emphasize (that is, "warning—caution") the proper closing of the canopy.	
144.	V_{ne} and High-Speed Flight	The aircraft should be operated the aircraft within the approved envelope. However, it is recommended that transonic operations by limited by 10 percent below MMO. This provides a good safety margin and could be addressed in the operating limitations, the AFM, and related standard operating procedures (SOP).	
145.	Fuel Mismanagement	Require special emphasis on fuel starvation. There are issues with the fuel system, including fuel not feeding from tips, gages, fuel venting, and fuel leaks.	
146.	G Loading Limitations	"G" limitations are a good safety margin. Two limitations are proposed: a maximum of +5/-2G in a clean configuration.	
147.	Speed Limitations Due To Avionics and Other Equipment.	Verify the speed limit of the aircraft. Some Alpha Jet operators may install certain types of avionics such as the Aspen EFD-1000 PFD Pro system. However, it is important to note the top speed of this installation is 450 knots. With some luggage carriers, the aircraft is limited to 325 knots.	
148.	External Tank(s) Failure	Restrict external tanks to only those cleared by the manufacturer. Adhere to the drop tank limitations related to (1) takeoff and landing performance, (2) G limits, (3) airspeed, and (4) fuel in the tanks. There should not be any means of jettisoning these tanks while on the ground or in flight. There should not be any modifications to the drop tanks.	
149.	Specific Range	Recommend SOPs addressing minimum landing fuel. Verify actual aircraft-specific range (nautical air miles traveled per pound of fuel used).	
150.	Asymmetric Wing Mounted Stores	No asymmetric wing mounted equipment is permitted regardless of the -1.	
151.	Bingo and Minimum Landing Fuel	To add a safety margin, and in addition to § 91.151, Fuel Requirements for Flight in VFR Conditions, recommend establishing SOPs addressing minimum landing fuel for IFR operations as provided in § 91.167. In addition, a "Bingo" fuel status (a pre-briefed amount of fuel for an aircraft that would allow a safe return to the base of intended landing) should be used in all flights. Note: Bingo fuel and minimum landing fuel are not necessarily the same in that a call for Bingo fuel and an RTB still required managing the minimum landing fuel.	
152.	Suspected Flight Control Failure	Recommend establishing SOPs for troubleshooting suspected in-flight control failures, that is, specific checklist procedures, altitude, and clear location.	
153.	FAA AC 91-79	Recommend using FAA AC 91-79, Runway Overrun Prevention. According to AC 91-79, safe landings begin long before touchdown. Adhering to standard operating procedures and best practices for stabilized approaches will always be the first line of defense in preventing a runway overrun.	

Additional Resources

- Alpha Jet accident data.
- Australia's CAAP 30-3(0), *Approved Maintenance Organization (AMO) - Limited Category Aircraft*, Civil Aviation Advisory Publication, December 2001. This publication addresses the restoration and maintenance of ex-military aircraft and is an excellent guide for developing adequate aircraft maintenance and inspection programs.
- Chamberlain, H. Dean. FAA News, *Armed and Dangerous*, November/December 2003.
- CJAA *Safety Operations Manual*, Rev. June 30, 2008.
- Colavita, M. Chemistry Dept. of CSV, Italian Air Force. *Occurrence of Corrosion in Airframes.* RTO AVT Lecture Series on "Aging Aircraft Fleets: Structural and Other Subsystem Aspects," November 2000.
- COMNAVAIRFORINST 4790.2A, chapter 16, *Intermediate Level (I-Level) Maintenance Data System (MDS) Functions, Responsibilities, and Source Document Procedures*, CH-2 10, November 2009.
- Defense and Civil Institute of Environmental Medicine, Department of National Defense, Canada. *Ejection Systems and the Human Factors: A Guide for Flight Surgeons and Aeromedical Trainers*, May 1988.
- Drury, Colin G. and Watson, Jean (FAA). *Human Factors Good Practices in Borescope Inspection*, June 7, 2001.
- FAA AC 5220-9, *Aircraft Arresting Systems*.
- FAA AC 150/5300-13, *Airport Design*.
- FAA AC 150/5220-22, *Engineered Materials Arresting Systems* (EMAS) for Aircraft Overruns
- Morris, Greg. EAA Warbirds of America. Warbird (magazine), *Warbird Airmanship*, March 2009.
- NATO. AFSP-1(A), *Aviation Safety*, March 2007.
- NATOPS. OPNAVINST 3710.7U, *General Flight and Operating Instructions*, November 23, 2009.
- NATOPS. NAVAIR 00-80R-14, *U.S. Navy Aircraft Firefighting and Rescue Manual*, October 15, 2003.
- *Naval Aviation Maintenance Program Standard Operating Procedures* (NAMPSOPs), CHAPTER 10.
- NAVAIR 00-80T-109, *Aircraft Refueling NATOPS Manual*, June 15, 2002.
- NAVPERS 00-8-T-80, *Aerodynamics for Naval Aviators*. January 1965.
- New Zealand Civil Aviation Authority AC 43-21 *Escape and Egress Systems*, December 25, 1997.
- Safety Regulation Group, Civil Aviation Authority (UK). CAA Document No. 743, *Civil Air Displays: A Guide for Pilots*, 2003.
- Transport Canada. *Maintenance and Manufacturing Staff* Instructions, MSI 52, Issuance of Special Certificate of Airworthiness—Limited, March 31, 2006.
- USAF. AFP 127-1 and NAVAIR 00-80T-116-2, *Technical Manual Safety Investigation, Volume II Investigative Techniques*, July 31, 1987.
- USAF TO 1-1-300, Maintenance Operational Checks and Flight Checks, June 15, 2012.
- USAF TO 1-1-691, Corrosion Prevention and Control Manual.

- USAF TO 1-1A-1 Engineering Handbook Series for Aircraft Repair, General Manual for Structural Repair, November 15, 2006.
- U.S. Department of Defense. Manual 4160.28 (volume 3), *Defense Demilitarization: Procedural Guidance*, June 7, 2011.

Recommendations for Review of Prior Actions

- As provided by § 91.415, review the submitted maintenance manual(s) and AIP. Work with the applicant to revise the AIP as needed based on any concerns identified in attachment 2 to this document. For example, an Alpha Jet AIP can be modified to address or verify—
  - Consistency with the applicable military TOs for airframe, powerplant, and systems to verify replacement/interval times are addressed.
  - All AIP section and sub-sections include the proper guidance/standards (that is, TOs or Engineering Orders) for all systems, groups, and tasks.
  - No "on condition" for items that have replacement times unless proper technical data to substantiate the change, that is, aileron boost and oxygen regulator.
  - Ejection seat system replacement times are adhered to. No "on condition" for rocket moors and propellants. Make the distinction between replacement times, that is, "shelf life" v. "installed life limit."
- Any deferred log is related to a listing of minimum equipment for flight.
- Inclusion of document revision page(s).
- Request a detailed program letter from the applicant to verify proposed operations are consistent with the purpose of the airworthiness certificate. For example, there may be a need to review the proposed airports to be used.
- Verify the application for airworthiness does not constitute brokering. Section 21.191(d) was not intended to allow for the brokering or marketing of experimental aircraft. This includes individuals who manufacture, import, or assemble aircraft, and then apply for and receive experimental exhibition airworthiness certificates so they can sell the aircraft to buyers. Section 21.191(d) only provides for the exhibition of an aircraft's flight capabilities, performance, or unusual characteristics at air shows, and for motion picture, television, and similar productions. Certificating offices must verify all applications for exhibition airworthiness certificates are for the purposes specified under § 21.191(d) and are from the registered owners who will exhibit the aircraft for those purposes. Applicants must also provide the applicable information specified in § 21.193.
- Review any related documents from U.S. Customs and Border Protection and the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) for the aircraft. If the aircraft was not imported as an aircraft, or if the aircraft configuration is not as stated in Form ATF-6, it may not be eligible for an airworthiness certificate. There are many cases in which Federal authorities have questioned the origin of former military aircraft and its installed weapon system. Some have been seized.